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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/687,541	10/16/2003	David A. Morgenstern	MTC 6888.2 (39-21 (52925)	7748
321	7590	09/07/2006	EXAMINER	
SENNIGER POWERS ONE METROPOLITAN SQUARE 16TH FLOOR ST LOUIS, MO 63102			ECHELMAYER, ALIX ELIZABETH	
			ART UNIT	PAPER NUMBER
			1745	

DATE MAILED: 09/07/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/687,541

Applicant(s)

MORGENSTERN, DAVID A.

Examiner

Alix Elizabeth Echelmeyer

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 16 October 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-87 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-87 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 16 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date See Continuation Sheet.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_.

Continuation of Attachment(s) 3. Information Disclosure Statement(s) (PTO/SB/08), Paper No(s)/Mail Date :3-19-04, 4-16-04, 5-3-04, 4-14-05, 5-9-05, 10-31-05, 12-1-05, 6-15-06, 7-25-06.

## DETAILED ACTION

### *Priority*

1. Applicant's claim to priority to 60/490,231 and 60/419,653 is acknowledged.

### ***Claim Rejections - 35 USC § 102***

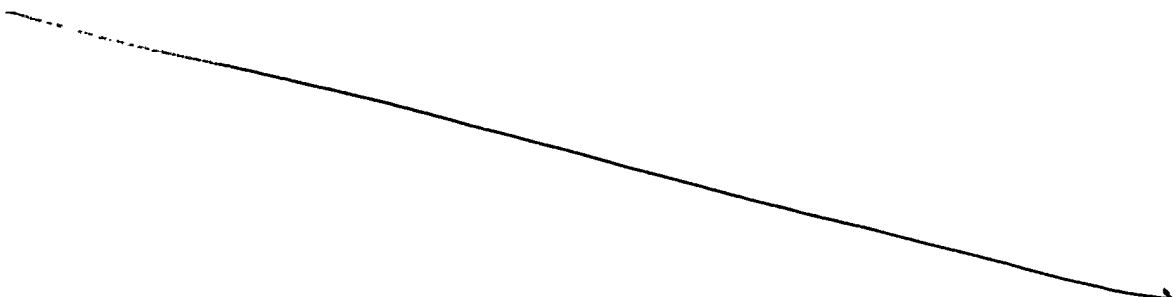
2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1, 2, 22-25, 27, 28, 51 are rejected under 35 U.S.C. 102(b) as being anticipated by Ostgard et al. (US Pre-Grant Publication 2001/0018402).

Ostgard et al. teach dehydrogenation of alcohols, specifically ethanol ([0016]-[0021]), using a fixed bed Raney copper catalyst (abstract). As is known in the art and discussed in the specification of the instant application, Raney catalysts have a sponge-like appearance due porosity caused by etching during fabrication of the catalyst. The catalyst can be made of granules, or pellets, bonded to a support ([0003]). The process can be carried out at a temperature up to 250°C ([0032]).



***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. Claims 3 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ostgard et al. in view of Pettit (US Patent 6,077,620).

The teachings of Ostgard et al. as discussed above are incorporated herein.

Ostgard et al. disclose the production of hydrogen using a reforming catalyst but fail to teach the use of the hydrogen generated in that process in a fuel cell.

Pettit teaches a fuel cell system wherein an alcohol, for example ethanol, travels through a fuel reformer having a catalyst bed. The products of the fuel reformation reaction pass through a water-gas shift and preferential oxygen reactors before being fed to the fuel cell where it is reacted with oxygen to produce power. Exhaust gas from the fuel cell is provided to a combustor, which provides heat to a heat exchanger used

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to heat the fuel reformer (abstract; Figure 1; column 1 lines 43-45; column 3 lines 1-27, 33).

It would be desirable to use the reforming process of Ostgard et al. in the fuel cell system of Pettit in order to provide hydrogen as fuel for the fuel cell from the source ethanol.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use the process of Ostgard et al. in the system of Pettit in order to provide hydrogen to the fuel cell to produce electric power.

7. Claims 4-26, 29-31 and 33-52 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ostgard et al. as applied to claims 1 and 27 above, and further in view of Wainwright et al. ("Raney Nickel-Copper Catalysts II. Surface and Pore Structures" 1980).

The teachings of Ostgard et al. as discussed above are incorporated herein.

Ostgard et al. teach the dehydrogenation of alcohol over a bed of Raney copper catalyst but fails to teach the specific limitations of the catalyst of the instant application.

Wainwright et al. teach Raney Nickel-Copper Catalysts having varying compositions and varying properties. Based on the research presented, Wainwright et al. found that the addition of nickel to the copper catalysts lead to greater production of hydrogen (abstract).

Regarding claims 4-6, 9-11, 33-35, 39-41 and 87, Table 1 teaches different catalysts meeting these criteria. For example, with regard to claims 4 and 33, each of

catalysts 1-6 meets the surface area requirement. With regard to claims 6 and 35, catalysts 1 and 2 meet the requirements.

As for claims 7, 8, 12-21, 26, 36, 37, 42-50 and 52, Table 2 teaches various catalysts having these requirements for composition. For example, catalysts 3-4 meet the requirements of claims 7, 8, 36 and 37 since these catalysts contain more than 10% and less than 90% by weight copper.

Regarding claims 29-31, the catalyst of Wainwright et al. meets the limitations of the catalyst of the instant application, and would therefore inherently have the properties required in these claims.

Regarding claim 38, the porous Raney catalyst of Ostgard et al. or Wainwright et al. comprises a metal sponge.

It would be advantageous to use any of the variations of the catalysts Wainwright et al. including nickel as the catalyst of Ostgard et al. since hydrogen evolution increases with increasing amounts of nickel in a Raney copper catalyst.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use the catalyst of Wainwright et al. in order to improve hydrogen generation in Ostgard et al.

8. Claims 53-57 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pettit in view of Ostgard et al.

Regarding claim 53, Pettit teaches a fuel cell system wherein an alcohol, for example ethanol, travels through a fuel reformer having a catalyst bed. The products of the fuel reformation reaction pass through a water-gas shift and preferential oxygen reactors before being fed to the fuel cell where it is reacted with oxygen to produce power (abstract; Figure 1; column 1 lines 43-45; column 3 lines 1-27, 33).

As for claim 57, exhaust gas from the fuel cell is provided to a combustor, which provides heat to a heat exchanger used to heat the fuel reformer (Figure 1).

Regarding claim 54, it can be seen in Figure 1 that water is fed to the fuel reformer along with alcohol. As for claims 55 and 56, the water-gas shift reaction reduces the carbon monoxide levels in the fuel stream in a separate chamber, thus requiring a separate catalyst.

Pettit fails to disclose the type of catalyst used in the fuel reformer.

Ostgard et al. teach a process for reforming ethanol into hydrogen using a Raney copper catalyst, as discussed above and incorporated herein.

It would be advantageous to use the catalyst taught by Ostgard et al. in the fuel reformer of Pettit since the catalyst of Ostgard et al. is not deactivated by an undesirable poisoning or undesirable abrasion ([0009]).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use the catalyst of Ostgard et al. in the fuel cell system of Pettit in order to prevent deactivation of the catalyst by undesired poisoning or abrasion.



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9. Claims 4-26, 19-31, 33-52, and 64-87 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pettit in view of Ostgard et al. as applied to claim 53 above, and further in view of Wainwright et al.

The teachings of Ostgard et al., Pettit and Wainwright et al. as discussed above are incorporated herein.

Pettit in view of Ostgard et al. teaches the use of the catalyst of Ostgard et al. in the fuel cell system of Pettit but fails to teach the specific limitations of the catalyst of the instant invention.

Wainwright et al. teach Raney Nickel-Copper Catalysts having varying compositions and varying properties. Based on the research presented, Wainwright et al. found that the addition of nickel to the copper catalysts lead to greater production of hydrogen (abstract).

Regarding claims 69-71 and 75-77, Table 1 teaches different catalysts meeting these criteria. For example, with regard to claim 69, each of catalysts 1-6 meets the surface area requirement. With regard to claim 71, catalysts 1 and 2 meet the requirements.

As for claims 72, 73 and 78-85, Table 2 teaches various catalysts having these requirements for composition. For example, catalysts 3-4 meet the requirements of claims 72 and 73 since these catalysts contain more than 10% and less than 90% by weight copper.

With regard to claims 64, 65, 74 and 86, Ostgard et al. teach these requirements, as discussed in the 102(b) rejection above.

Regarding claims 66-68, the catalyst of Wainwright et al. meets the limitations of the catalyst of the instant application, and would therefore inherently have the properties required in these claims.

It would be advantageous to use any of the variations of the catalysts Wainwright et al. including nickel as the catalyst of Pettit in view of Ostgard et al. since hydrogen evolution increases with increasing amounts of nickel in a Raney copper catalyst.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use the catalyst of Wainwright et al. in order to improve hydrogen generation in Pettit in view of Ostgard et al.

10. Claims 58-60 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pettit in view of Ostgard et al. as applied to claim 53 above, and further in view of Sugita et al. (US Patent 4,820,594).

The teachings of Pettit and Ostgard et al. as discussed above are incorporated herein.

Pettit in view of Ostgard et al. teaches a fuel cell system that reforms ethanol into hydrogen to produce fuel to run a fuel cell, and reacting the exhaust from the fuel cell in a combustor to provide heat for the reformation reaction. Pettit in view of Ostgard et al. further teaches the use of the system in a vehicle (column 1 line 23). Pettit in view of Ostgard et al. fails to teach using the energy created by the combustor as mechanical or additional electric power or used to drive a generator.

Sugita et al. teach the use of a combustor in a fuel cell system to power a generator that is connected to a drive assembly (column 3 lines 14-19).

It would be advantageous to connect the combustor of Pettit and Ostgard et al. to a drive assemble as taught by Sugita et al. in order to improve the efficiency of the fuel cell system by reducing waste of heat or power that could be used within the system.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use the combustor of Pettit in view of Ostgard et al. in the manner taught by Sugita et al. in order to improve the efficiency of the fuel cell system.

11. Claims 61-63 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pettit in view of Ostgard et al. as applied to claim 53 above, and further in view of Yu et al. (US Patent 6,541,142).

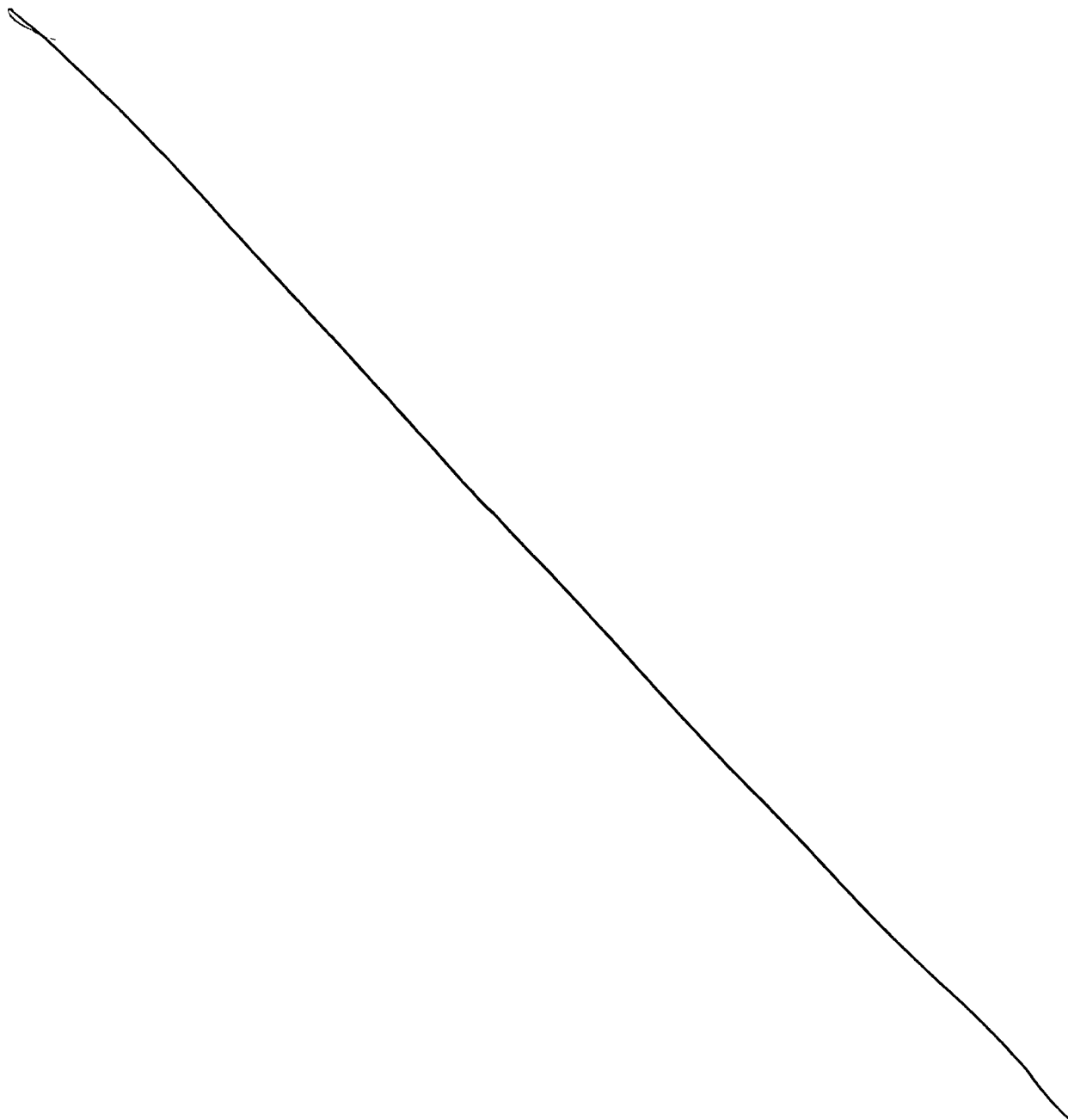
The teachings of Pettit and Ostgard et al. as discussed above are incorporated herein.

Pettit and Ostgard et al. teach the fuel cell system but fail to teach the use of the combustor having a separate fuel source in addition to the exhaust from the fuel cell for use in heating the system during a cold start.

Yu et al. teach a combustor fed by fuel cell off-gases and a separate methanol source to overcome problems during cold start by providing a fuel source to be reacted in the combustor that is not dependent on the fuel cell being run (Figure; column 2 lines 40-44).

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Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use a separate fuel source, as taught by Yu et al., to provide fuel to the combustor of Pettit et al. during cold start ups so that the combustor can have fuel for combustion that does not need to be produced by the fuel cell.



**Conclusion**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alix Elizabeth Echelmeyer whose telephone number is 571-272-1101. The examiner can normally be reached on Mon-Fri 7-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

GREGG CANTELMO  
PRIMARY EXAMINER



Alix Elizabeth Echelmeyer  
Examiner  
Art Unit 1745

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